



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

**NATIONAL CERTIFICATE
APRIL EXAMINATION
ENGINEERING SCIENCE N1**

6 APRIL 2016

This marking guideline consists of 12 pages.

- ✓ = 1 mark.
- ✓ = ½ mark.

Calculations:

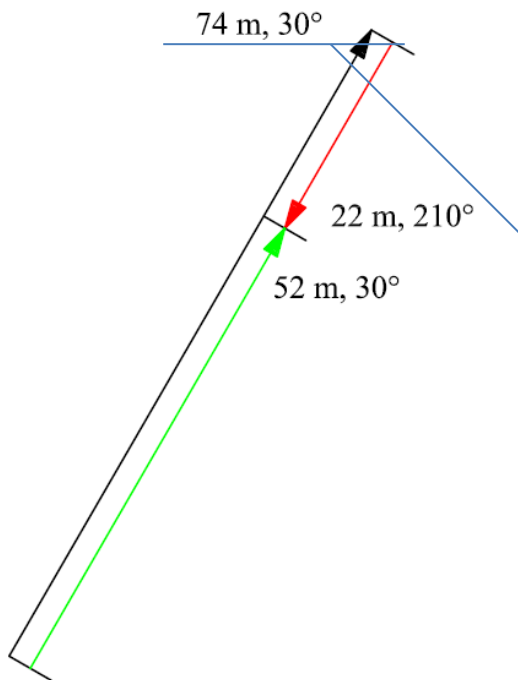
- 1 mark for substitution and conversion of values.
- 1 mark for answer and unit.
- -½ mark for using the incorrect unit.

QUESTION 1

- | | | |
|-----|-------|---|
| 1.1 | 1.1.1 | C |
| | 1.1.2 | D |
| | 1.1.3 | B |
| | 1.1.4 | A |

(4 x 1) (4)

1.2



✓✓ Resultant = 52 m, 30° ✓ (2)

1.3 1.3.1

$$v = \frac{s}{t}$$

$$s = v \cdot t$$

$$s = 375 \times \left(\frac{15}{60}\right) \quad \checkmark \checkmark$$

$$s = 93,75 \text{ km}$$

1.3.2

$$v = \frac{s}{t}$$

$$t = \frac{s}{v}$$

$$t = \frac{93,75}{375 \times 25\%} \checkmark \checkmark$$

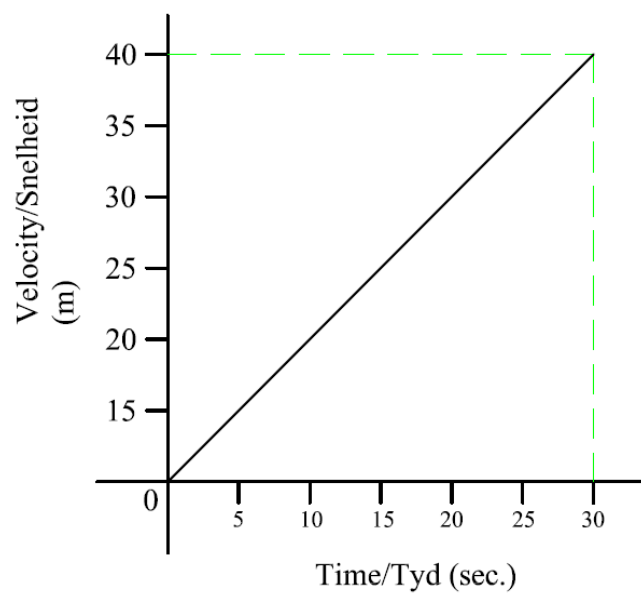
$$t = \frac{93,75}{468,75}$$

$$t = 0,2 \text{ hours}$$

$$t = 12 \text{ min}$$

(2 x 2) (4)

1.4 1.4.1



✓✓✓

(3)

1.4.2

$$a = \frac{\Delta v}{t}$$

$$a = \frac{40}{30} \checkmark \checkmark$$

$$a = 1,333 \text{ m.s}^{-2}$$

(2)
[15]

QUESTION 2

- 2.1 2.1.1 False
 2.1.2 False
 2.1.3 True
 2.1.4 True
 2.1.5 False

(5 x 1) (5)

2.2 2.2.1

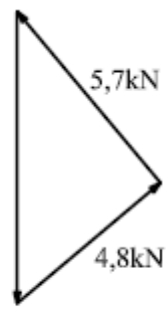
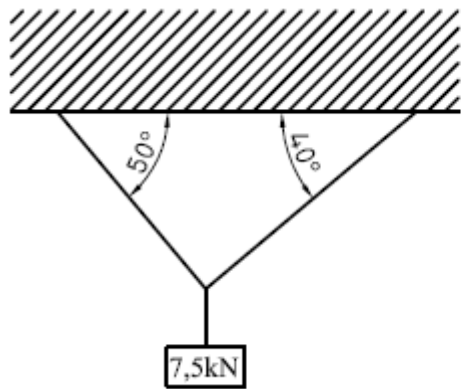
$$VR = \frac{E_{Dist}}{L_{Dist}}$$
$$E_{Dist} = VR \times L_{Dist} \quad \checkmark \checkmark$$
$$E_{Dist} = 3 \times 3,5$$
$$E_{Dist} = 10,5 \text{ m}$$

2.2.2

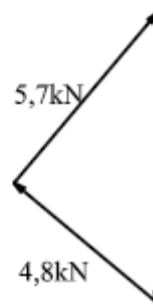
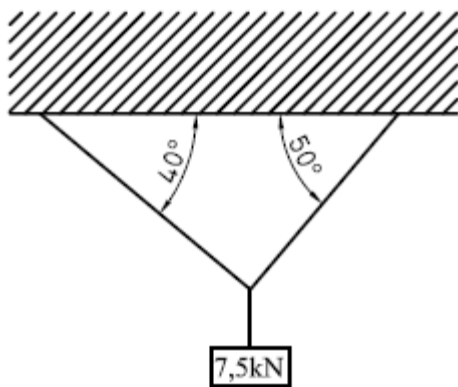
$$MA = \frac{L}{E}$$
$$E = \frac{L}{MA} \quad \checkmark \checkmark$$
$$E = \frac{550}{2,5}$$
$$E = 220 \text{ N}$$

(2 x 2) (4)

2.3



✓✓✓



OR

By calculations

Consider both A and B up

	A	B	125N
x	$-A \cos 40^\circ = -0,766A$	$B \cos 50^\circ = 0,643B$	0
Y	$A \sin 40^\circ = 0,643$	$B \sin 50^\circ = 0,766B$	-125

$$\sum x = 0$$

$$-0,766A + 0,643B = 0$$

$$B = 1,191A$$

1

$$\sum y = 0$$

$$0,643A + 0,766B = 7,5$$

2

1 in 2

$$0,643A + 0,766 \times 1,191A = 7,5$$

$$A = 4,823N$$

Therefore

$$B = 1,191 \times 4,823 = 5,744 \text{ kN}$$

✓✓✓

(3)

2.4 $LM = RM$

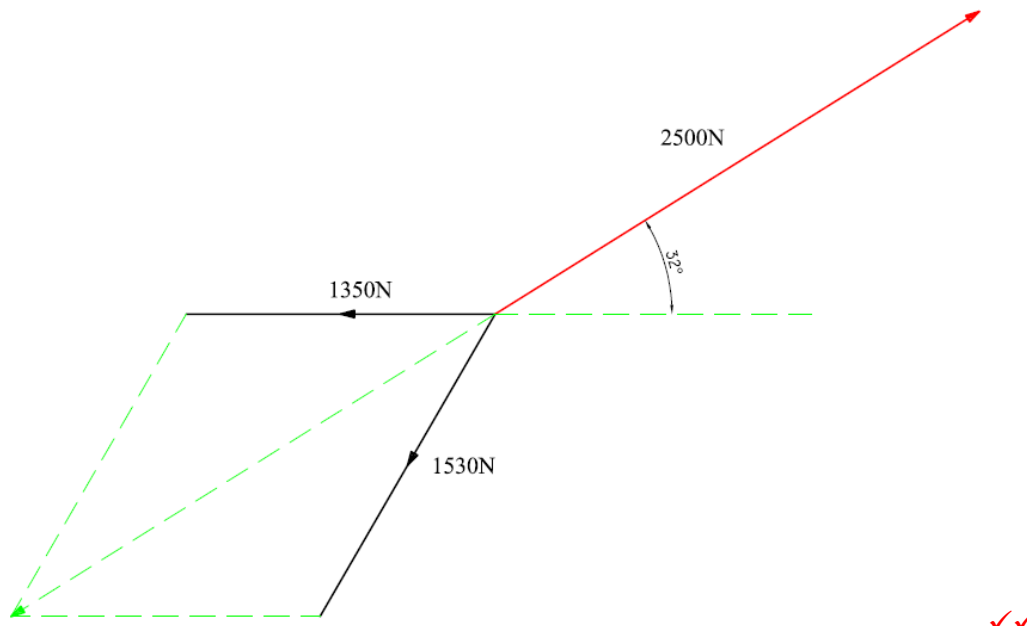
$$P \times 3 = 125 \times 2$$

$$P = \frac{125 \times 2}{3} \quad \checkmark \checkmark$$

$$P = 83,333 \text{ N}$$

(2)

2.5



Equilibrant = 2500N East 32°North ✓

✓✓

OR

By calculations

(3)
[17]

QUESTION 3

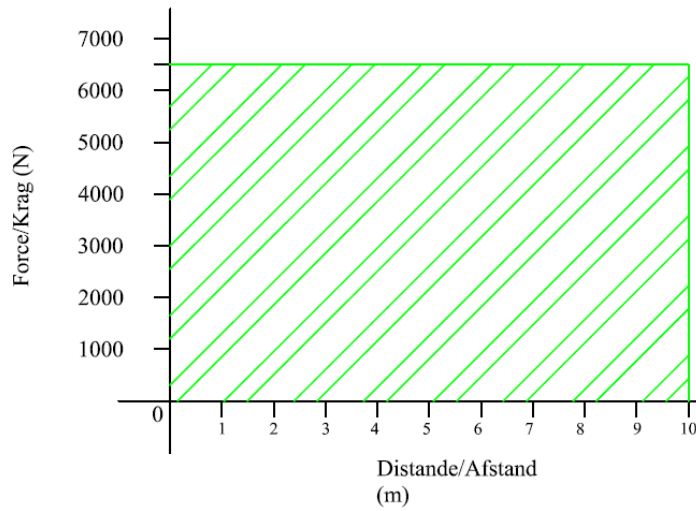
- 3.1 3.1.1 B
- 3.1.2 A
- 3.1.3 B
- 3.1.4 A
- 3.1.5 B

(5 x 1) (5)

- 3.2 $W = F \times s$
- $W = 525 \times 200$
- $W = 105\ 000$ ✓✓
- $W = 105\ kJ$

(2)

3.3 3.3.1



✓✓✓

(3)

3.3.2

$$W = F \times s$$

$$W = 6\,500 \times 10$$

$$W = 65\,000\text{ J}$$

$$W = 65\text{ kJ}$$

✓✓

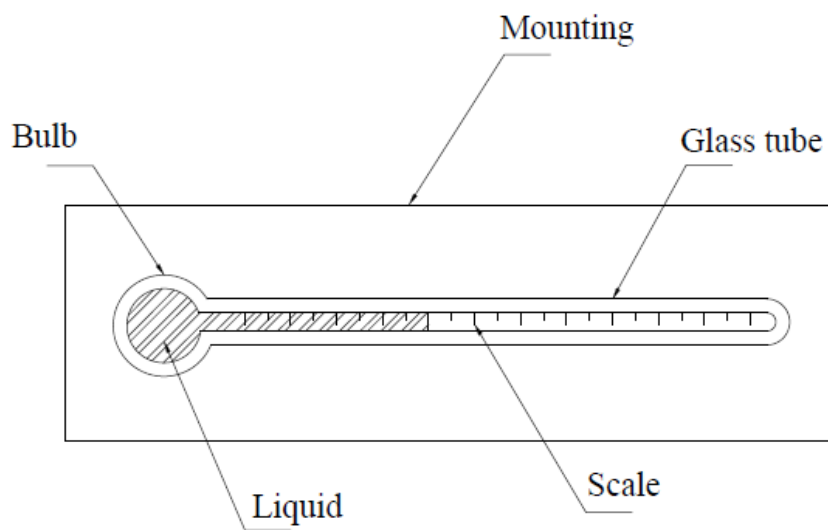
(2)
[12]

QUESTION 4

- 4.1 4.1.1 Higher
- 4.1.2 Lower
- 4.1.3 Removed
- 4.1.4 Radiation pyrometer
- 4.1.5 Joule

(5 x 1) (5)

4.2



✓✓✓

(3)

4.3	4.3.1	Conduction		
	4.3.2	Convection		
	4.3.3	Convection/radiation		
			(3 x 1)	(3)
4.4		$Q = m \times c \times \Delta t$		
		$Q = 250 \times 4187 \times (55 - 15)$ ✓✓		
		$Q = 418\,700\,000\text{ J}$		
		$Q = 41,87\text{ MJ}$		(2)
4.5	4.5.1	$\Delta l = l_o - l_f$		
		$\Delta l = 36 - 35,105$ ✓		
		$\Delta l = 0,895\text{m}$		
		$\Delta l = 895\text{ mm}$		
	4.5.2	$\Delta t = t_o - t_f$		
		$\Delta t = 85 - 25$ ✓		
		$\Delta t = 60\text{ }^\circ\text{C}$		
			(2 x 1)	(2)
4.6	4.6.1	Heat is transferred between the lead and water.		
	4.6.2	The law of conservation of energy.		
	4.6.3	The temperature of both materials is the same.		
			(3 x 1)	(3)
				[18]

QUESTION 5

5.1	5.1.1	Atom		
	5.1.2	Matter		
	5.1.3	Molecule		
	5.1.4	Melting		
	5.1.5	Condensation		
			(5 x 1)	(5)
5.2		Gas: particles far from each other		
		Liquid: particles not far from each other		
		Solid: particles close to each other		(3)
5.3		Electron – negative		
		Neutrons – neutral		
		Proton – positive		(3)

- 5.4 When an atom has gained or lost an electron. ✓ (1)
[12]

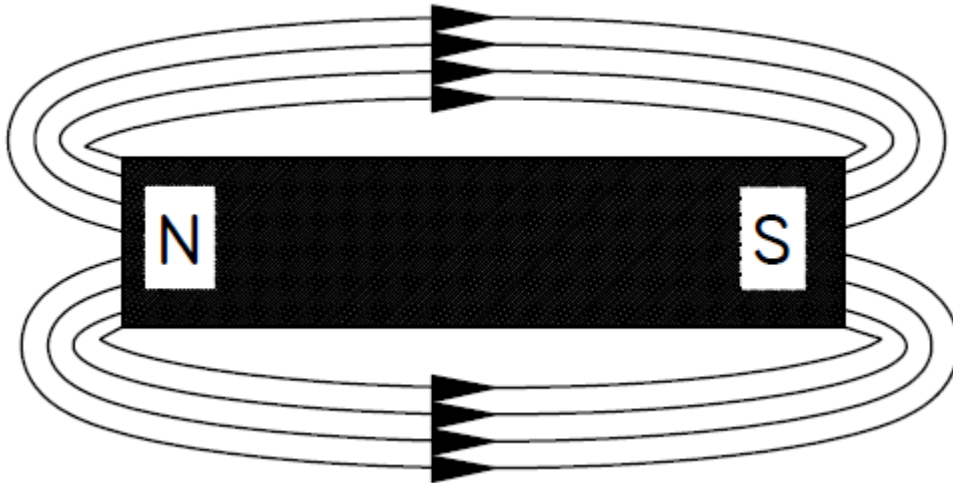
QUESTION 6

- 6.1 6.1.1 C
6.1.2 D
6.1.3 A
6.1.4 E
6.1.5 B (5 x 1) (5)
- 6.2 6.2.1 Insulator – is a material that prevents the flow of electrical current.
- 6.2.2 Resistance – is a material that resists the flow of electrical current.
- 6.2.3 Potential difference – is the electrical pressure required to overcome the resistance in order for a current to flow.
- 6.2.4 Joule's Law – the quantity of heat generated by an electrical current is directly proportional to ????. Is something not missing here? (4 x 1) (4)
- 6.3 6.3.1 $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}$
 $\frac{1}{R_t} = \frac{1}{125} + \frac{1}{230}$ ✓✓
 $R_t = 80,986\Omega$
- 6.3.2 $I = \frac{V}{R}$
 $I = \frac{24}{80,986}$ ✓✓
 $I = 0,296A$
 $I = 296mA$
- 6.3.3 $P = V \times I$ $P = I^2 R$ $P = \frac{V^2}{R}$
 $P = 24 \times 0,296$ OR $P = 0,296^2 \times 80,986$ OR $P = \frac{24^2}{80,986}$ ✓✓
 $P = 7,104W$ $P = 7,096W$ $P = 7,112W$ (3 x 2) (6)

ENGINEERING SCIENCE N1

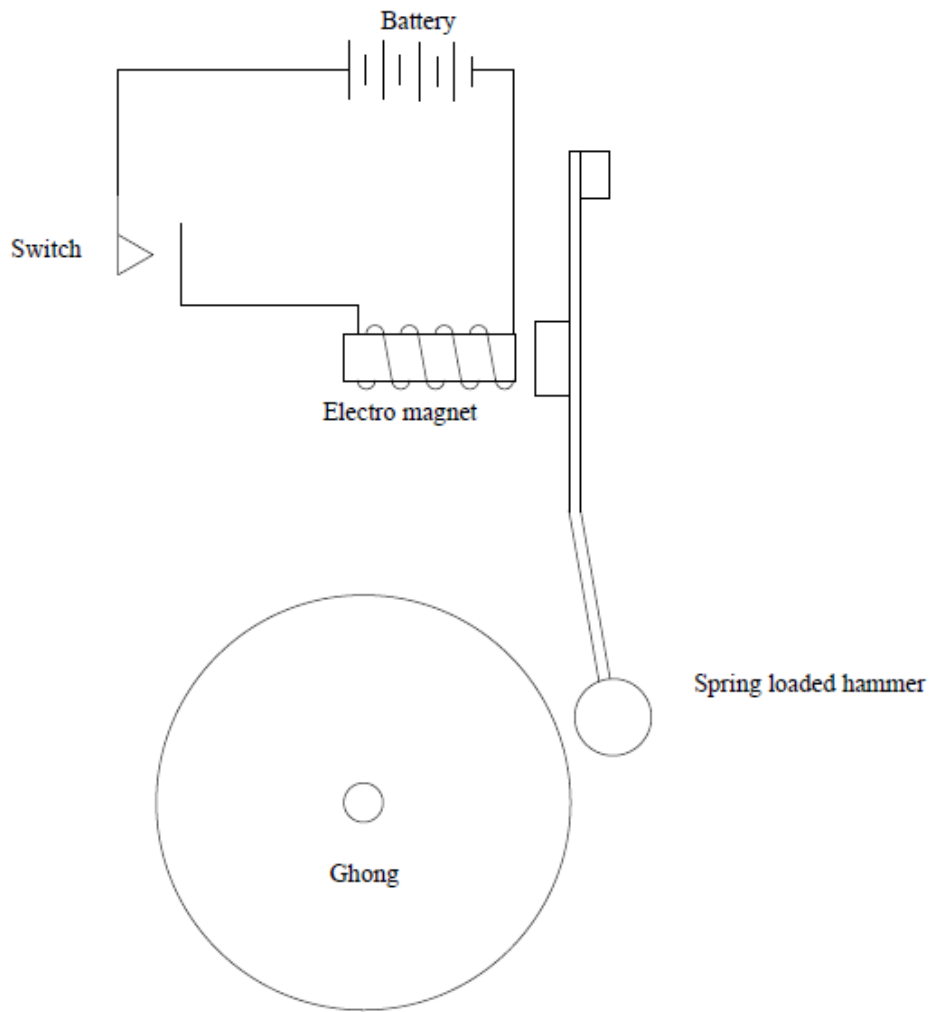
- 6.4 6.4.1 Resistivity – Different metals have different resistances.
- 6.4.2 Length – The longer the conductor, the higher the resistance. (2 x 1) (2)
- 6.5 6.5.1 Alloys – no change in resistance. ✓
- 6.5.2 Insulators – The resistance decreases with the rise in temperature. ✓ (2 x 1) (2)

6.6



✓✓✓ (3)

6.7



✓✓✓✓

(4)
[26]

TOTAL: 100